(12) UK Patent Application (19) GB (11) 2 327 963 (13) A

(43) Date of A Publication 10.02.1999

(21) Application No 9817269.5

(22) Date of Filing 07.08.1998

(30) Priority Data
(31) 9716843 (32) 09.08.1997 (33) GB
(31) 9809408 (32) 02.05.1998

(51) INT CL[6]
E21B 37/02

(52) UK CL (Edition Q)
E1F FLC

(56) Documents Cited
GB 2295632 A SU 001232794 A US 3912012 A

(58) Field of Search
UK CL (Edition P) E1F FKA FLC
INT CL[6] E21B
Online: WPI

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(54) Abstract Title
Downhole scraper and packer apparatus

(57) A method of setting a packer in a bore comprises the steps: mounting a packer on an elongate member; mounting a casing scraper 10 on the elongate member; running the packer and the casing scraper 10 into a bore on the elongate member to a section of the bore where the packer is to be set; cleaning the section of bore with the scraper 10; and setting the packer in the cleaned section of bore. The scraper 10 is adapted for mounting to a packer or elongate member by the threaded male projection 20. The scraper comprises: a mandrel; a resilient sleeve 14 mounted on the mandrel; and a plurality of scraper members 16 on the sleeve 14, the members 16 being radially movable relative to the mandrel.

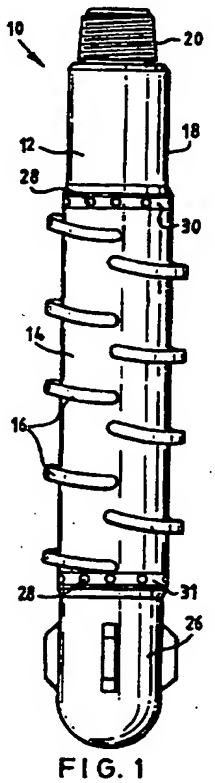

FIG. 1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

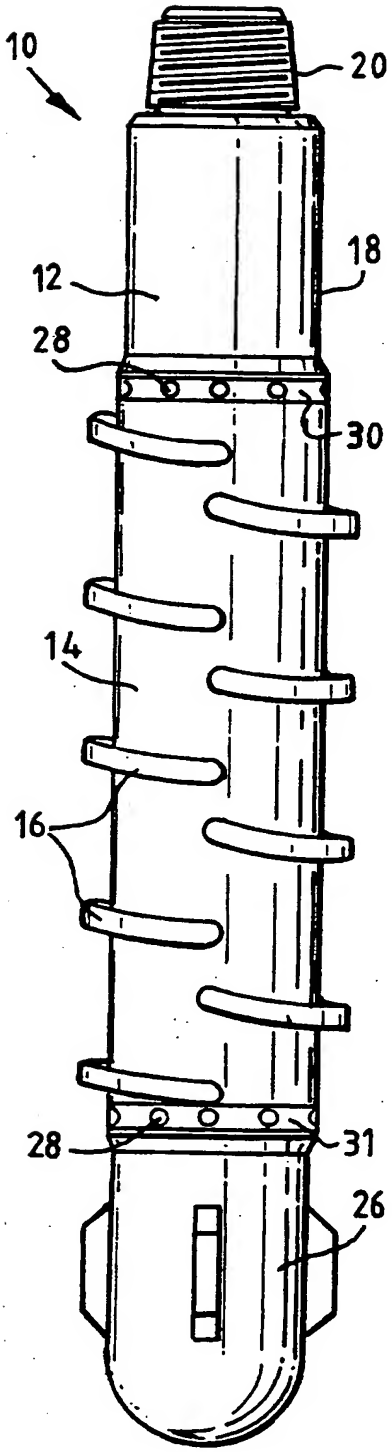

FIG. 1

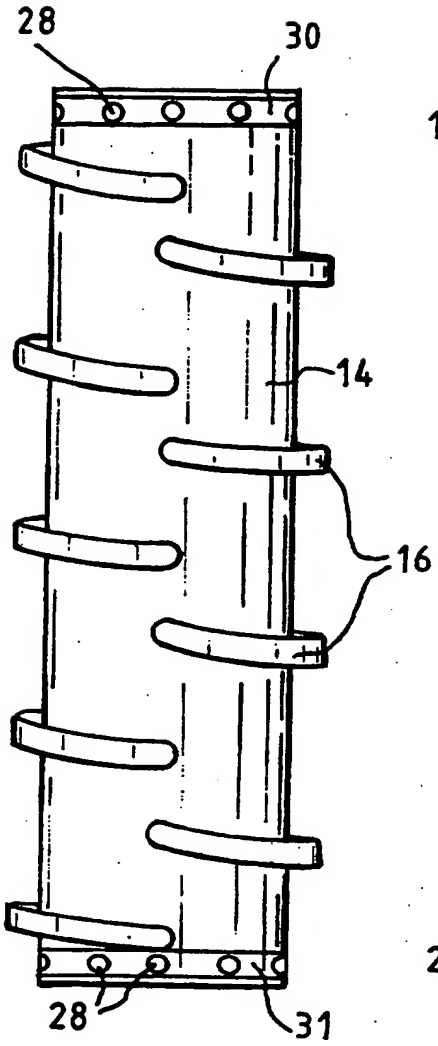

FIG. 2

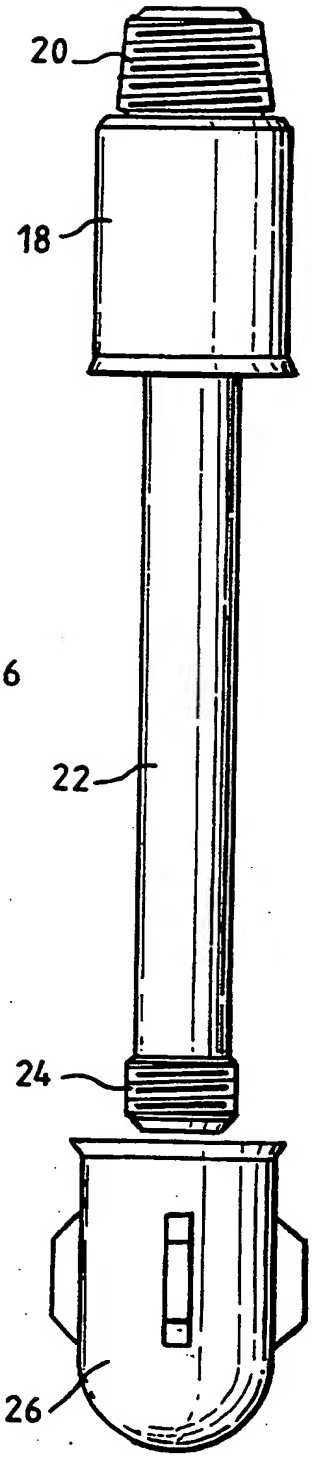

FIG. 3

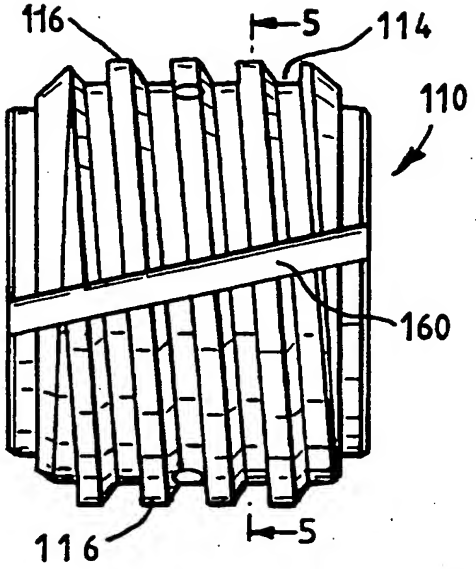

FIG. 4.

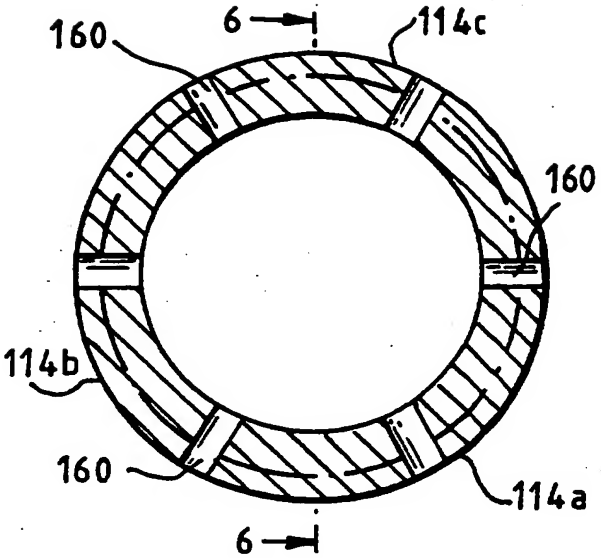

FIG.5

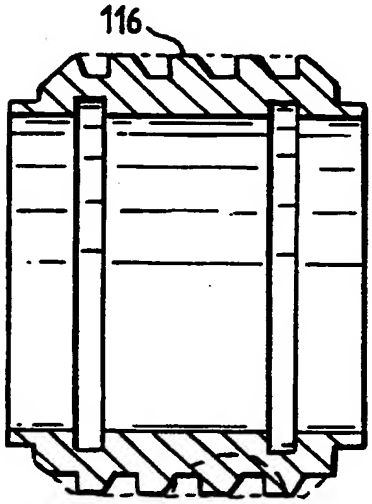

FIG.6

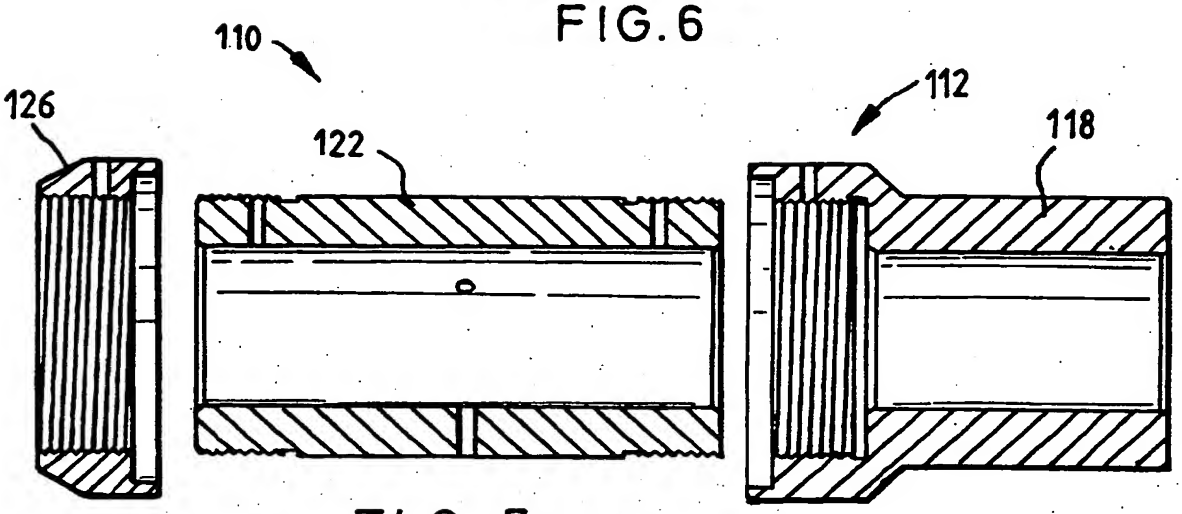

FIG. 7

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DOWNHOLE APPARATUS

This invention relates to downhole apparatus, and in particular to a casing scraper.

In the oil and gas exploration and production industries, bores are drilled to gain access to underground hydrocarbon reservoirs. The bores are lined with steel tubing or casing, which may be cemented in place. From time to time it may be desired to isolate a section of bore, or a section of bore wall, and this is often achieved by means of device known as a packer. Conventional packers include radially expandable portions for sealing engagement with the casing. Typically, a packer is run into a bore on the lower end of a "string", which may be in the form of drill pipe, coiled tubing, wireline or the like. In many instances it is preferable to prepare the bore section where the packer is to be set by cleaning the casing wall. Conventionally, this is achieved by running a drill pipe-mounted casing scraper into the bore. The scraper is then removed from the bore and the packer run in and set in the appropriate section of the bore.

It is among the objectives of embodiments of the present invention to provide a more efficient method of cleaning a section of casing-lined bore in preparation for the setting of a packer.

According to the present invention there is provided

a method of setting a packer in a bore, the method comprising:

mounting a packer on an elongate member;

mounting a casing scraper on the elongate member;

running the packer and the casing scraper into a bore on the elongate member to a section of the bore where the packer is to be set;

cleaning said section of bore with the scraper; and

setting the packer in the cleaned section of bore.

Typically, the packer and casing scraper will be released from the elongate member once the packer has been set. The elongate member is then withdrawn from the bore.

In this aspect of the present invention the scraper remains in the bore with the packer and thus the invention obviates the need for two trips or runs to: run in the scraper to clean the bore section; and then run in and set the packer. This represents a considerable saving in time and expense, and is thus particularly advantageous in deep bores and in offshore operations.

As used herein, the term "packer" is intended to encompass any sealing or isolating downhole apparatus that is intended to engage with a bore wall.

According to another aspect of the present invention there is provided downhole apparatus in the form of a casing scraper, the scraper being adapted for mounting to a packer so that the scraper may be run into a bore together with the packer.

Preferably, the scraper is adapted to be mounted below

the packer, and may be mounted directly to the packer.

Preferably also, the scraper defines cleaning members, which may be in the form of blades, having a radial extent which is similar to or greater than the diameter of the bore section to be cleaned. Most preferably, the cleaning members are resiliently mounted, to permit the scraper to pass through restrictions in the bore, and to provide a biassing force to enhance the cleaning effect of the members. In one embodiment, the cleaning members are mounted on a resilient sleeve. The sleeve may be unitary or may be in a plurality of rigid sections, for example three sections which are relatively radially movable. Alternatively, or in addition, springs may be provided for biassing the cleaning members outwardly. Such springs may be located internally of a resilient sleeve or rigid relatively movable sleeve segments. The members may be attached to the sleeve by appropriate fasteners but are preferably embedded or set into a sleeve of castable or mouldable material. The members may also be machined from the sleeve. The members preferably extend helically. Junk slots may extend longitudinally through the members to allow debris to flow past the members. Such slots preferably extend obliquely to ensure that the blades provide 360° coverage. The sleeve may be supported on a mandrel which permits radial movement of the cleaning members. The sleeve may be removably mounted on the mandrel. In one embodiment the sleeve is mounted between end stops or subs, one of the stops being removable to

facilitate removal and replacement of the sleeve. This permits a single mandrel configuration to carry sleeves of different diameters. The sleeve may be secured to the stops using appropriate fasteners, such as cap screws.

Preferably also, the scraper includes a bull-nosed centraliser, to prevent the scraper and packer from catching or snagging on protrusions when running into the bore.

According to a further aspect of the present invention there is provided a downhole casing scraper comprising: a mandrel adapted for coupling to an elongate member for running the scraper into a bore; a sleeve mounted on the mandrel; and a plurality of scraper members on the sleeve, the members being radially movable relative to the mandrel.

These and other aspects of the present invention will now be described, by way of example, with reference to the accompanying drawings in which:-

Figure 1 is a side view of the downhole casing scraper in accordance with a first embodiment of the present invention;

Figure 2 is a side view of the sleeve of the scraper of Figure 1;

Figure 3 is an exploded side view of the scraper of Figure 1 with the sleeve removed;

Figure 4 is an side view of the sleeve of a scraper in accordance with a second embodiment of the present invention;

Figure 5 is a sectional view on line 5 - 5 of Figure

4;

Figure 6 is a sectional view on line 6 - 6 of Figure 5, and

Figure 7 is a sectional exploded view of a body of a scraper for mounting the sleeve of Figure 4.

Figures 1 to 3 of the drawings illustrate a downhole casing scraper 10 in accordance with a first embodiment of the present invention. The scraper comprises a body 12 on which a resilient sleeve 14 is mounted, the sleeve 14 carrying a plurality of scraper blades 16.

The scraper body 12 comprises a top sub 18 including a threaded male projection 20 for engaging with the lower end of a packer (not shown), or a section of drill pipe attached to a packer. A main mandrel 22 extends downwardly from the top sub 18 and has a threaded lower end 24 for engaging with a corresponding female thread (not shown) defined by a bullnosed centraliser 26 which forms the lower end of the scraper 10.

The sleeve 14 is formed of a suitable elastomer and is removably mounted around the mandrel 22 between the top sub 18 and centraliser 26, which form upper and lower stops. The ends of the sleeve 14 are secured relative to the top sub 18 and the centraliser 26 by cap screws 28 extending through respective end rings 30,31.

The scraper blades 16 are spaced axially and circumferentially around the sleeve 14 to provided 360° coverage around the scraper 10. The blades 16 are set into the sleeve 14 and are radially movable relative to the

scraper body 12 due to the resilience of the sleeve 14.

In use, an assembled scraper 10 is mounted below a drill pipe-mounted packer, and the packer and scraper 10 then run into a bore together. The outer diameter of the scraper 10 or, more accurately, the outer diameter defined by the blades 16, is selected to match the diameter of the casing where the packer is to be set. Normally, the effective diameter of the blades 16 will be selected to be slightly greater than the casing diameter, to ensure an effective cleaning contact between the blades 16 and the casing surface. As the scraper 10 and packer are run into the bore, the assembly may have to pass through restrictions, and this is accommodated by the flexibility of the sleeve 14 which permits the blades 16 to be deflected inwardly to reduce the effective diameter of the scraper 10. On reaching the section of bore where the packer is to be set, the scraper 10 may simply be pushed through the section, or may be moved axially through the section a number of times. The packer is then located in the cleaned section and set to engage the casing wall. The drill pipe is then disconnected from the packer and retracted from the bore.

Thus, the scraper remains in the bore with the packer until the packer is retrieved.

It will be apparent to those of skill in the art that this operation may be carried out more quickly and more efficiently than the conventional method of running a scraper in separately of the packer, and retrieving the

scraper from the bore before the packer is run in and set.

In addition, the provision of a removable sleeve 14 allows the scraper manufacturer to produce a single body configuration which is capable of accommodating sleeves 14 and blades 16 of various different dimensions and configurations. Further, once a scraper 10 has been retrieved from a bore, the sleeve 14 and blades 16 may be readily removed and replaced to allow re-use of the scraper body 12.

Figures 4 to 7 of the drawings illustrate a downhole casing scraper 110 in accordance with a second embodiment of the present invention. The scraper comprises a body 112 (Figure 7) on which a sleeve 114 (Figure 4 to 6) is mounted, the sleeve 114 defining three helically extending scraper blades 116.

The scraper body 112 comprises a top sub 118, a sleeve 122, and a bottom sub 126, which are adapted to be threaded and pinned together. The sleeve 122 is of smaller diameter than the subs 118, 126, to accommodate the sleeve 114.

The sleeve 114 is formed of a three sections 114a - c and is adapted to be removably mounted on the sleeve 122 between the top sub 118 and bottom sub 126, which form upper and lower stops and define undercut annular grooves to retain the sleeve ends.

The sleeve sections 114a - c are separated by inclined junk slots 160, the slots 160 being inclined to ensure 360° blade coverage around the scraper 110.

Hoop-type springs (not shown) are located in annular

slots in the inner faces of the sleeve sections 114a - c to bias the sections outwardly. The sleeve sections 114a - c may be pinned to the sleeve 122 to prevent relative rotational movement, while permitting radial movement.

It will further be apparent to those of skill in the art that the above described embodiments are merely exemplary of the present invention, and that various modifications and improvements may be made thereto without departing from the scope of the invention. For example, the flexible sleeve 14 described above is formed of an elastomer to provide a resilient mounting for the blades 16. However, other resilient blade mounting arrangements may be utilised. In a further embodiment, bow springs may be provided between the blades or the sleeve and the main mandrel 22 to resiliently support the blades 16. Further, in other embodiments the blades may be provided separately of the sleeve, for attachment to the sleeve using suitable fasteners. Also, in the illustrated embodiment the top sub 18 is provided with a connector in the form of a threaded male projection 20, though of course any suitable form of coupling may be provided.

CLAIMS

1. A method of setting a packer in a bore, the method comprising:

mounting a packer on an elongate member;

mounting a casing scraper on the elongate member;

running the packer and the casing scraper into a bore on the elongate member to a section of the bore where the packer is to be set;

cleaning said section of bore with the scraper; and

setting the packer in the cleaned section of bore.

2. The method of claim 1, wherein the packer and casing scraper are released from the elongate member once the packer has been set, such that the elongate member may then withdrawn from the bore.

3. A casing scraper adapted for mounting to a packer so that the scraper may be run into a bore together with the packer.

4. The casing scraper of claim 3, wherein the scraper is adapted to be mounted below the packer.

5. The casing scraper of claim 4, wherein the scraper is adapted to be mounted directly to the packer.

6. The casing scraper of any of claims 3 to 5, wherein the scraper defines cleaning members having a radial extent which is similar to or greater than the diameter of the bore section to be cleaned.

7. The casing scraper of claim 6, wherein the cleaning members are in the form of blades.

8. The casing scraper of claim 6, wherein the cleaning members are resiliently mounted.

9. The casing scraper of claim 8, wherein the cleaning members are mounted on a sleeve.

10. The casing scraper of claim 9, wherein the sleeve is of resilient material.

11. The casing scraper of claim 9, wherein the sleeve is formed of a plurality of rigid sections which are radially movable.

12. The casing scraper of any of claims 8 to 11, wherein springs are provided for biassing the cleaning members outwardly.

13. The casing scraper of claim 12, wherein the springs may be located internally of a cleaning member mounting sleeve.

14. The casing scraper of any of claims 6 to 13, wherein the members extend helically.

15. The casing scraper of claim 14, wherein junk slots extend longitudinally through the members to allow debris to flow past the members.

16. The casing scraper of claim 15, wherein the slots extend obliquely such that the cleaning members provide 360° coverage.

17. The casing scraper of any of claims 6 to 16, wherein the cleaning members are mounted on a sleeve supported on a mandrel.

18. The casing scraper of claim 17, wherein the sleeve is removably mounted on the mandrel.

19. The casing scraper of claim 18, wherein the sleeve is mounted between end stops.

20. The casing scraper of claim 19, wherein at least one of the stops is removable to facilitate removal and replacement of the sleeve.

21. The casing scraper of claim 19 or 20, wherein the stops cooperate with the sleeve to limit radial movement of the sleeve.

22. The casing scraper of any of claims 3 to 21, in combination with a bull-nosed centraliser.

23. A downhole casing scraper comprising: a mandrel adapted for coupling to an elongate member for running the scraper into a bore; a sleeve mounted on the mandrel; and a plurality of scraper members on the sleeve, the members being radially movable relative to the mandrel.

The Patent Office

Application No: GB 9817269.5
Claims searched: 1-22

Examiner: Brendan Churchill
Date of search: 5 November 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): E1F FLC, FKA

Int Cl (Ed.6): E21B

Other: Online

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2295632 A	(Well-Flow Technologies)	3
X	SU 1232794 A1	(Turk Nebit-Dag Oil) Abstract and Figures	3-5 at least
X	US 3912012	(Continental Oil Company)	1, 3-7

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.